10. (Original) The circuit of claim 1 wherein the transimpedance element comprises a transimpedance amplifier configured for a fixed transimpedance, a programmable transimpedance, or an adaptively controlled transimpedance.

11. (Original) The circuit of claim 1 further comprises input matching impedance elements configured for matching to the corresponding inputs of the said transconductance elements.

12.-14. (Cancelled)

15. (Original) The circuit of claim 1 wherein the analog filter is configured as an finite impulse response (FIR) filter for equalizing an input signal in disk drives, optical , serial chip-to-chip, serial backplane high speed networks, or radio frequency communication systems.

16-30. (Cancelled)

REMARKS

In view of the following remarks and the amendments reconsideration and allowance are respectfully requested.

Claims 1-7, 9-11, and 15 are pending in this application, with claim 1 being independent. Claims 1-7, 9-11 and 15 have been amended.

Applicant asserts that no new matter has been added in the amended claims in this paper.

Claim Rejection as under 35 U.S.C. § 103 (a)

Amended claims 1-7, 9-11 and 15 are patentable at least because the distinct differences between the disclosure in this application from Kasper et al's U.S. Patent No. 5,055,795 titled "Traveling Wave Type Transversal Equalizer" and Shou et al's U.S. Patent No. 6,563,373 titled

"Filter Circuits Utilizing a plurality of Sampling and Holding Circuits" pointed out in the following:

1. The disclosure as described in the specification, in the drawings and in the claims, the disclosed analog filter uses transconductance elements and each transconductance element performs filtering function as well as converting the input signal into a current. The outputs of the transconductance elements are coupled together to form a current summing node to sum the output currents. The disclosure then uses a transimpedance to convert the output summed current into a filtered voltage output signal.

   Kasper et al.'s patent uses traveling wave amplifier whose input and output signals are both of the same type, namely, voltage signals, specifically as written in Kasper et al's Claim 1, "each of said first and second amplified electrical signals being an amplified replica of said input electrical signal". In addition, Kasper et al's patent does not have a current summing node and summed output current. Therefore, it is not possible to couple a "transimpedance element" to the output (303, 403) of Kasper et al's patent to make the claimed invention of this disclosure as stated in the Action of April 5, 2010.
2. The disclosure as described in the specification, in the drawings and in the claims, the disclosed analog filter does not uses any artificial transmission lines and uses only one transmission delay line. In addition, this disclosure does not require any time synchronization of input and output signals.

   In contrary to this disclosure, Kasper et al.'s patent uses two transmission delay lines one at the input of the traveling wave amplifier and one at the output of the traveling wave amplifier, specifically, stated in Kasper's independent claims 1 and 12: "said first and second amplification branches including an input artificial transmission line and an output artificial transmission line coupled to said in put port and said output port, respectively". It is well known in the art that traveling wave amplifiers require two transmission delay lines (real or artificial) in order to provide distributed amplification and time synchronization between input and output signals of the traveling wave amplifier.
3. Kasper el al.'s patent only has a forward propagation structure without any capability for

a feedback of the output signal, thus can not provide any IIR filtering capability as described in this invention shown in Fig. 3 and related specification text.

4. This disclosure uses two or more transconductance elements and one transmission delay line to perform continuous-time filtering functions as well as converting voltage signals at the inputs of the transconductance elements to currents at the outputs of the transconductance elements. This disclosure uses continuous-time transconductance elements and continuous-time transmission line delay elements to implement filtering functions in continuous time and without the need for sample and hold circuits.
   Shou et al's patent uses sampling and holding circuits, and digital multiplication coefficients to perform filtering functions. Because of its sampling and holding function, Shou et at's patent does not include continuous-time filtering and only works for low frequency input signals, specifically, for frequencies in the range of no more than a few hundred kHz as shown in Fig. 7 and related specification text. Shou et al's patent requires a significant amount of added sampling and holding circuits and the output filtered signal is only discrete-time versus this disclosure's continuous-time output filtered signal..
5. This disclosure uses one transmission delay line to delay an input signal and two or more transconductance elements to perform multiplication functions on delayed signals before converting filtered signals to currents to be summed at a current summing node which is finally converted to a filtered voltage signal by a transimpedance. The hybrid use of voltage and current modes allow this disclosure's invention of generating delays with a transmission line and processing multiplications with transconductors.
   Shou et al's patent instead performs all sample and hold, multiplication and summing functions in current mode. Specifically as shown in Fig. 8 and also described in Abstract of Shou et al's patent, a single voltage-to-current converter is used to first convert the input signal to an input current before performing discrete-time filter functions by the sampling and holding circuits then using multiple levels of adders to add the sampled currents before convert the added sampled current back to a voltage signal by a current-to-voltage converter.

Applicant respectfully asks that these rejections be withdrawn and the claims 1-7, 9-11 and 15 be allowed.

Interview Summary

Some technical differences of this application from the cited references were presented to the examiner:

Kasper et al's U.S. patent no. 5,055,795.

Kasper et al's patent uses traveling wave amplifier which requires two transmission delay lines in order to provide distributed amplification and time synchronization between input and output signals of the traveling wave amplifier versus this disclosure uses only one transmission delay line and no time synchronization.

Conclusion

It is believed that all of the pending issues have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this reply should be construed as intent to concede any issue with regard to any claim, except as specifically stated in this reply, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Respectfully submitted,

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